Big Changes in Energy: Why We Need to Pay Attention To Energy Policy Now

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If you remember nothing else:

- The U.S. economy and energy supplies and use are tightly linked.
- The U.S.' energy consumption continues to grow.
- We now have competition for world energy supplies from China and India.
- This competition affects our supplies and our prices.
- We need to think strategically about how we use and produce energy now.

The World Has a Lot of Energy But

- Is it in the right places?
- Do we have the means to transport that energy to the places we need it most?
- Some domestic energy resources are declining. Are the places where the energy is located politically stable?

More Questions

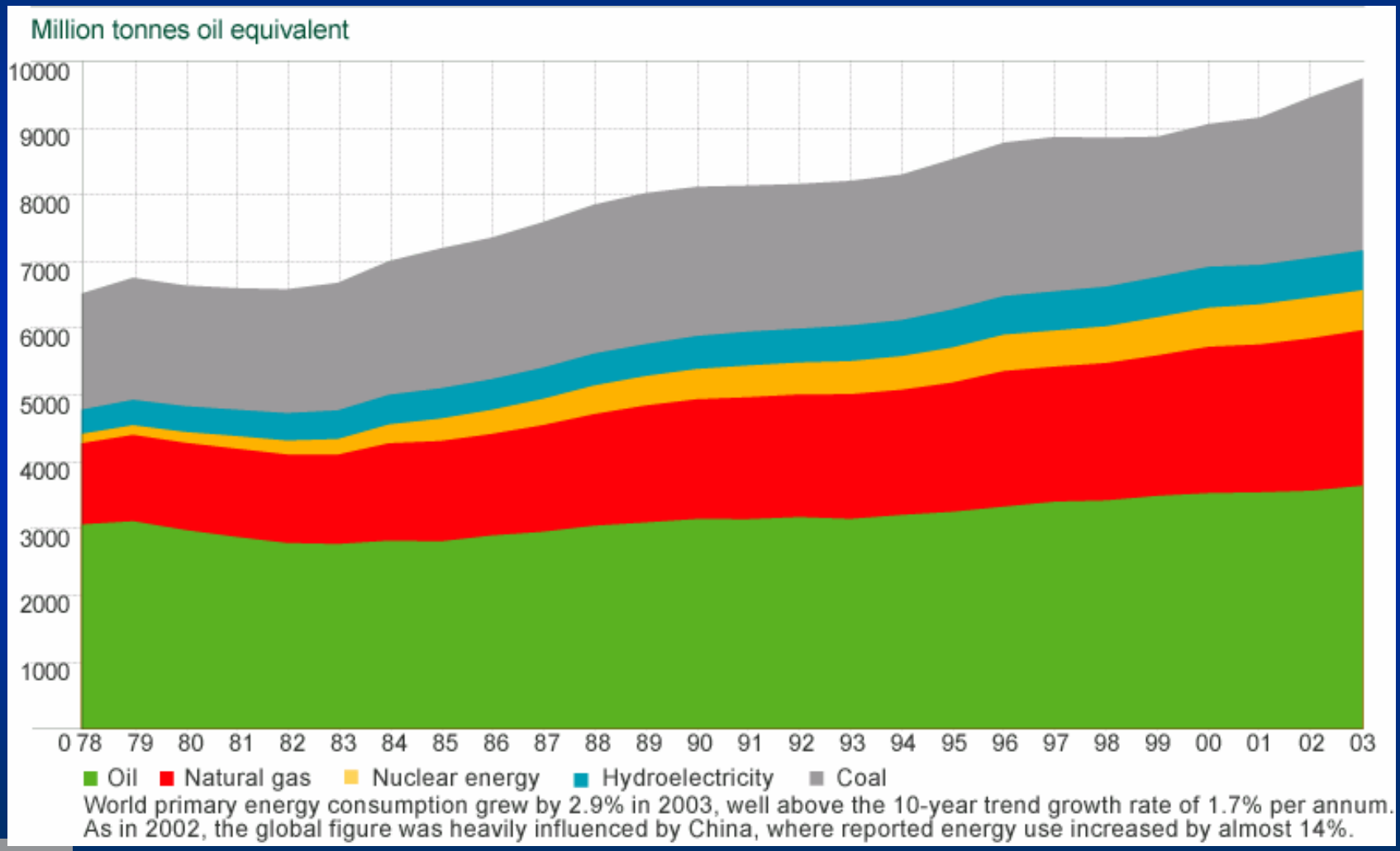
- Can we bear the risks that come with heavy reliance on imports?
- What environmental risks and regulations will affect our use of energy?

Risks and "Energy Security"

- **$2 Trillion Total Investment by 2015 to Meet Worldwide Demand according to BP**
- **Risks: Environmental and Logistical**
  - **2015: U.S. will import 65% oil, 30% gas**
  - **2015: Europe will import 80% oil & gas**
  - **Gas/Oil Not Located In Areas of Highest Demand**
- **Energy Security: Diversity of Suppliers, Price Competition, Demand Leverage**
- **U.S. Now Imports 11 MBD Oil from 57 Different Countries**

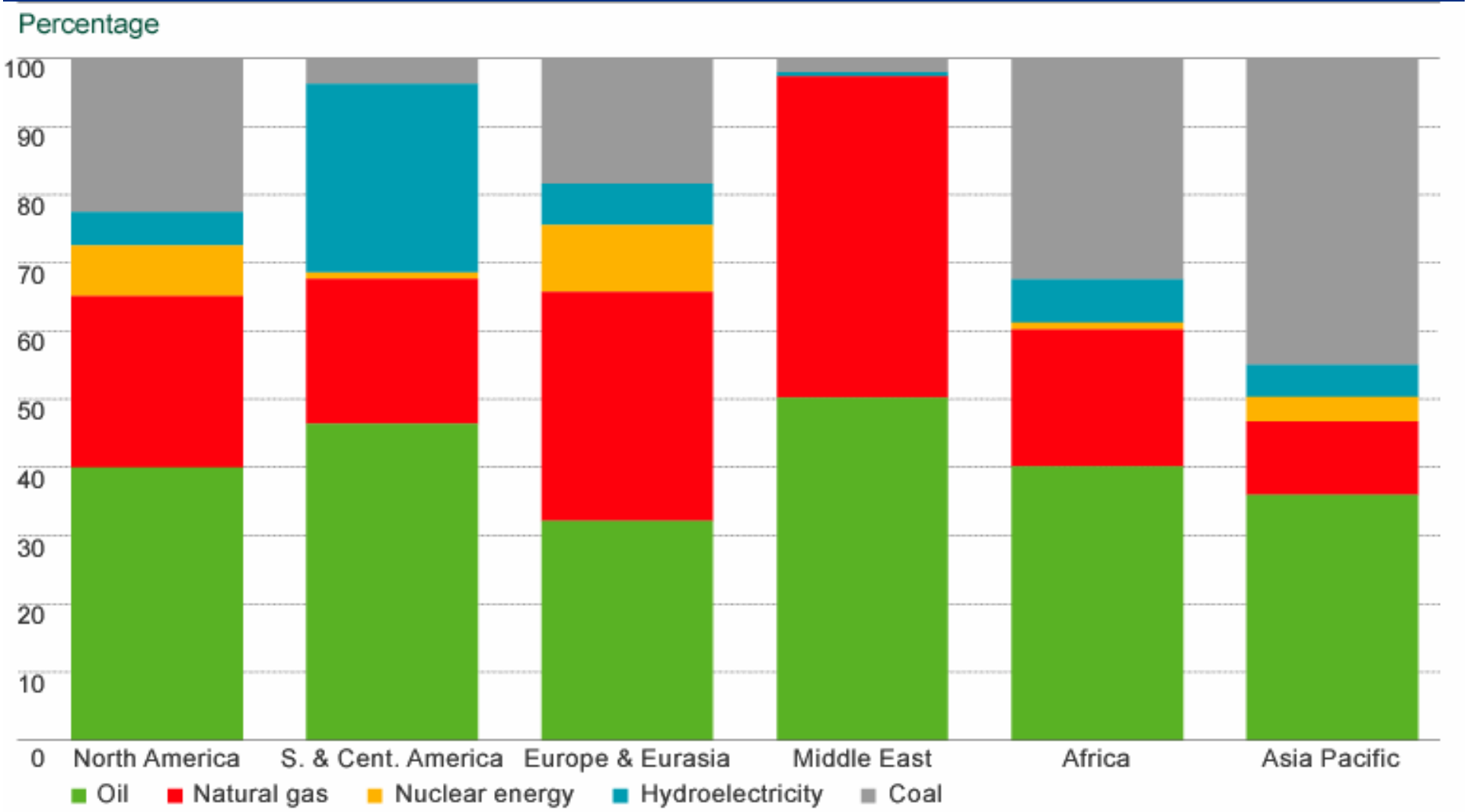
Source: BP

World primary energy consumption



BP Statistical Review of World Energy 2004

Regional primary energy consumption pattern 2003



Oil remains the largest single source of energy in most parts of the world. The exceptions are the Former Soviet Union, where gas dominates and Asia Pacific where coal is the dominant fuel.

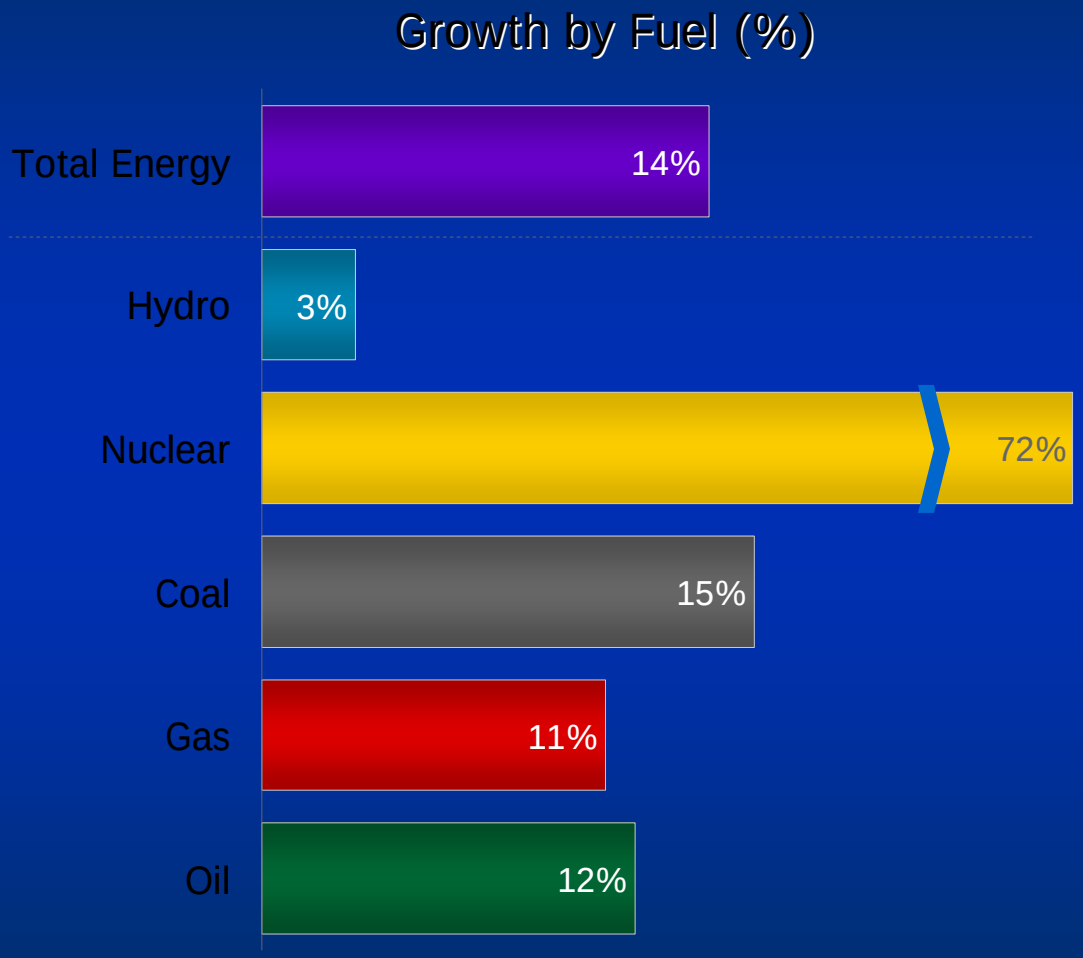
World Energy

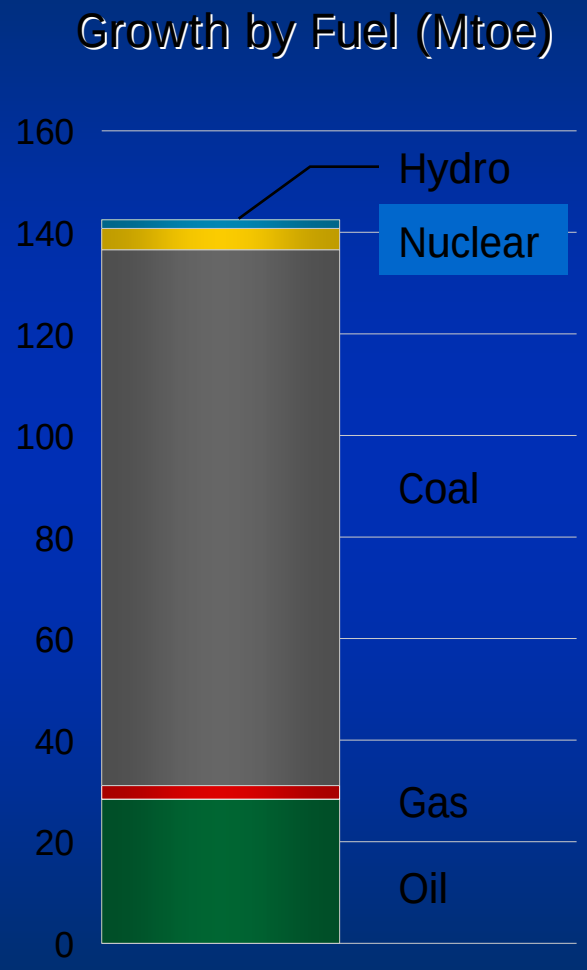
- **Driven by demographics and economics**
- **World Population Today: 6.3B and grows by 10,000 people each hour**
- **World population will reach 7.2B by 2015**
- **Chinese Economy has grown by a factor of 4 in the last 20 Yrs**
  - **China is now the 2nd largest Energy Consumer in the World (U.S. is 1st)**

Emerging Asia Drives Fuels & Emissions Growth

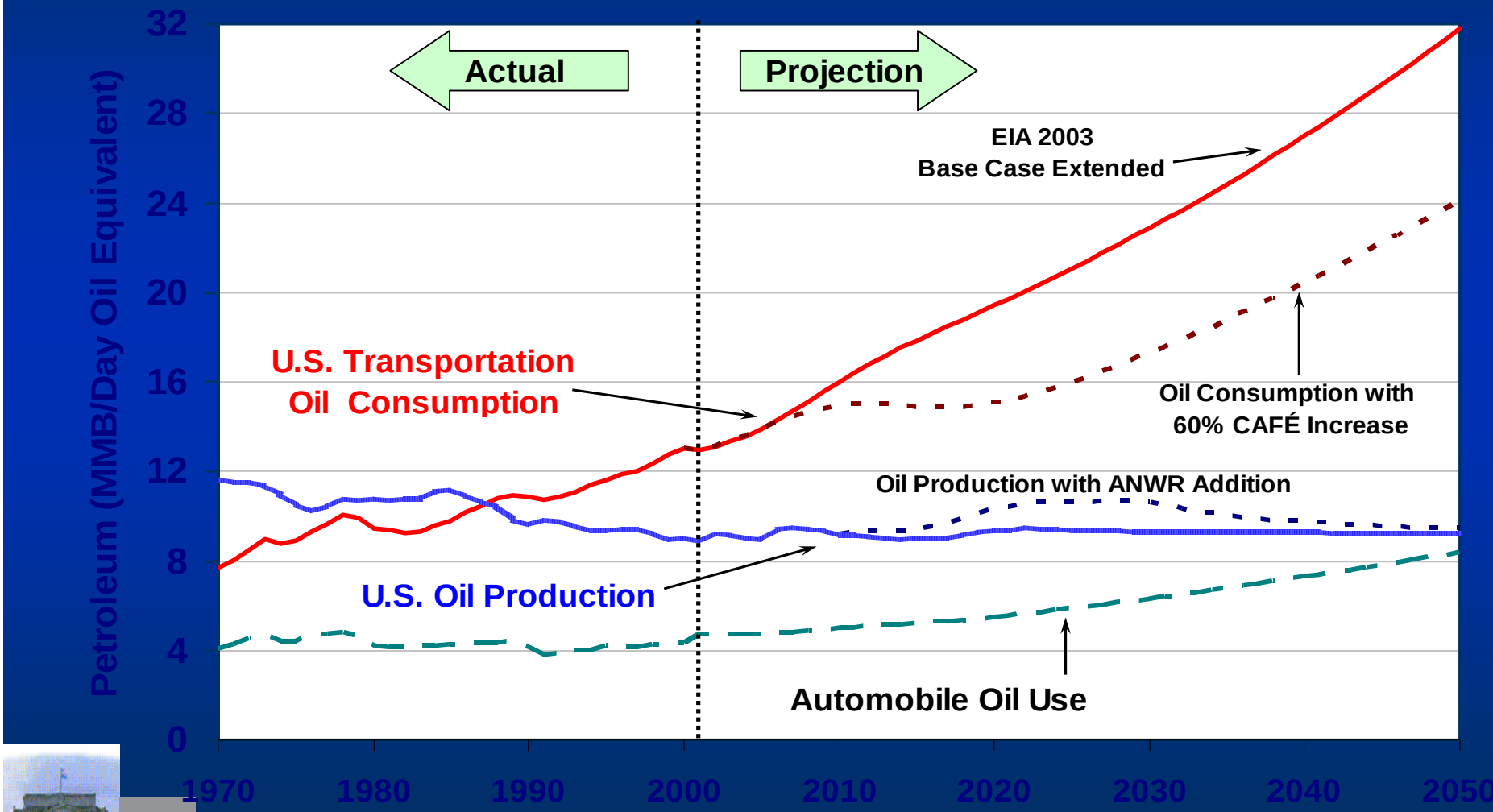
	North America		Europe		Emerging AP	
	2003	2030	2003	2030	2003	2030
Number Vehicles (Million)	235	325	230	270	55	420
Cars/1000	730	855	395	460	15	100
Efficiency (MPG)						
Fleet	20.5	29.0	31.5	39.0	19.0	25.0
New Sales	21.0	38.0	35.0	43.0	20.0	29.0
Advanced ICE/Diesel % Sales	1%	42%	39%	57%	13%	22%
Light Duty Fuels (MBD)	9.5	8.8	3.7	3.6	1.8	7.9
Carbon Emissions (G Tonnes/Yr)	0.35	0.33	0.14	0.14	0.07	0.30

China: Energy consumption growth, 2003

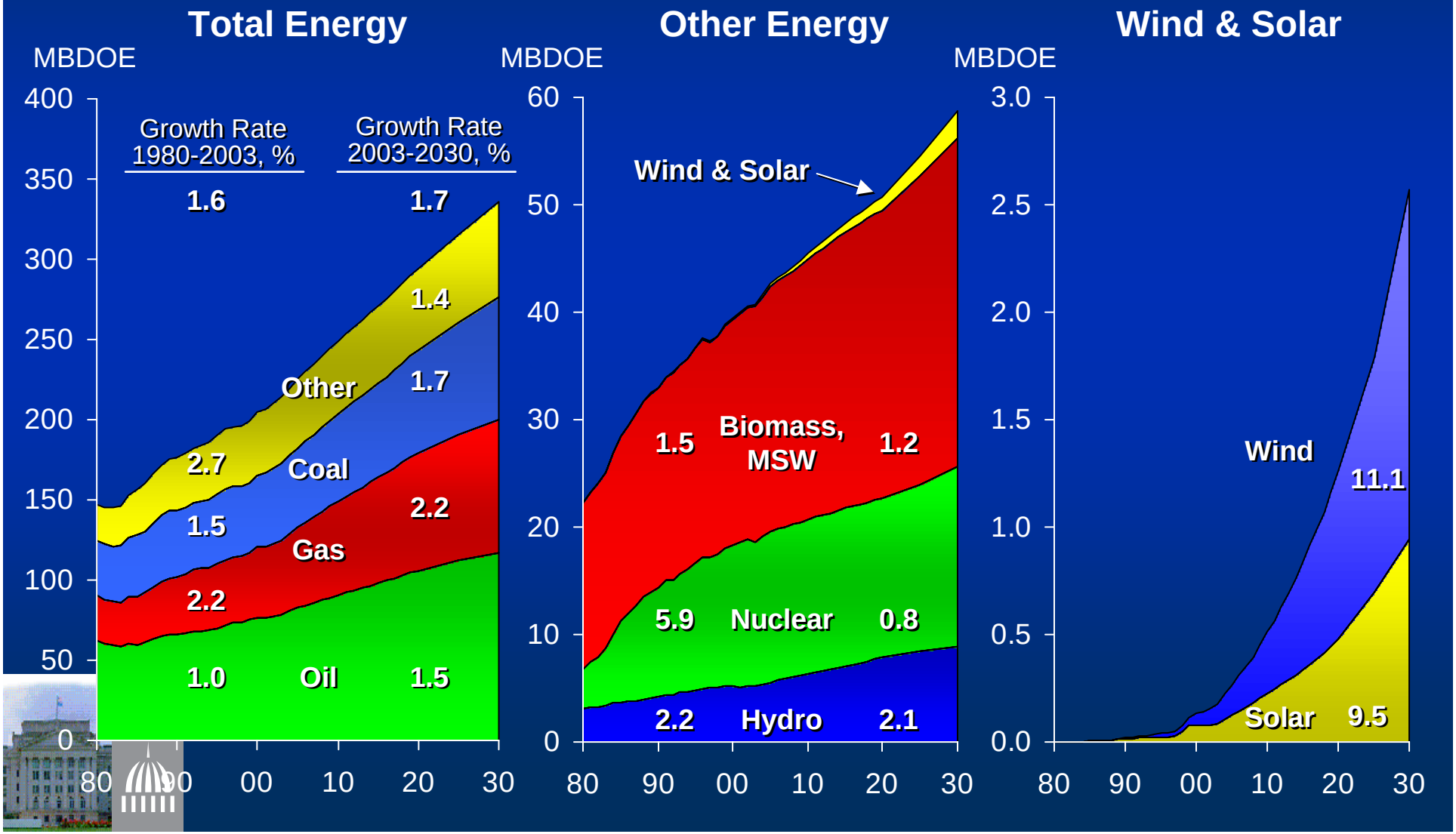




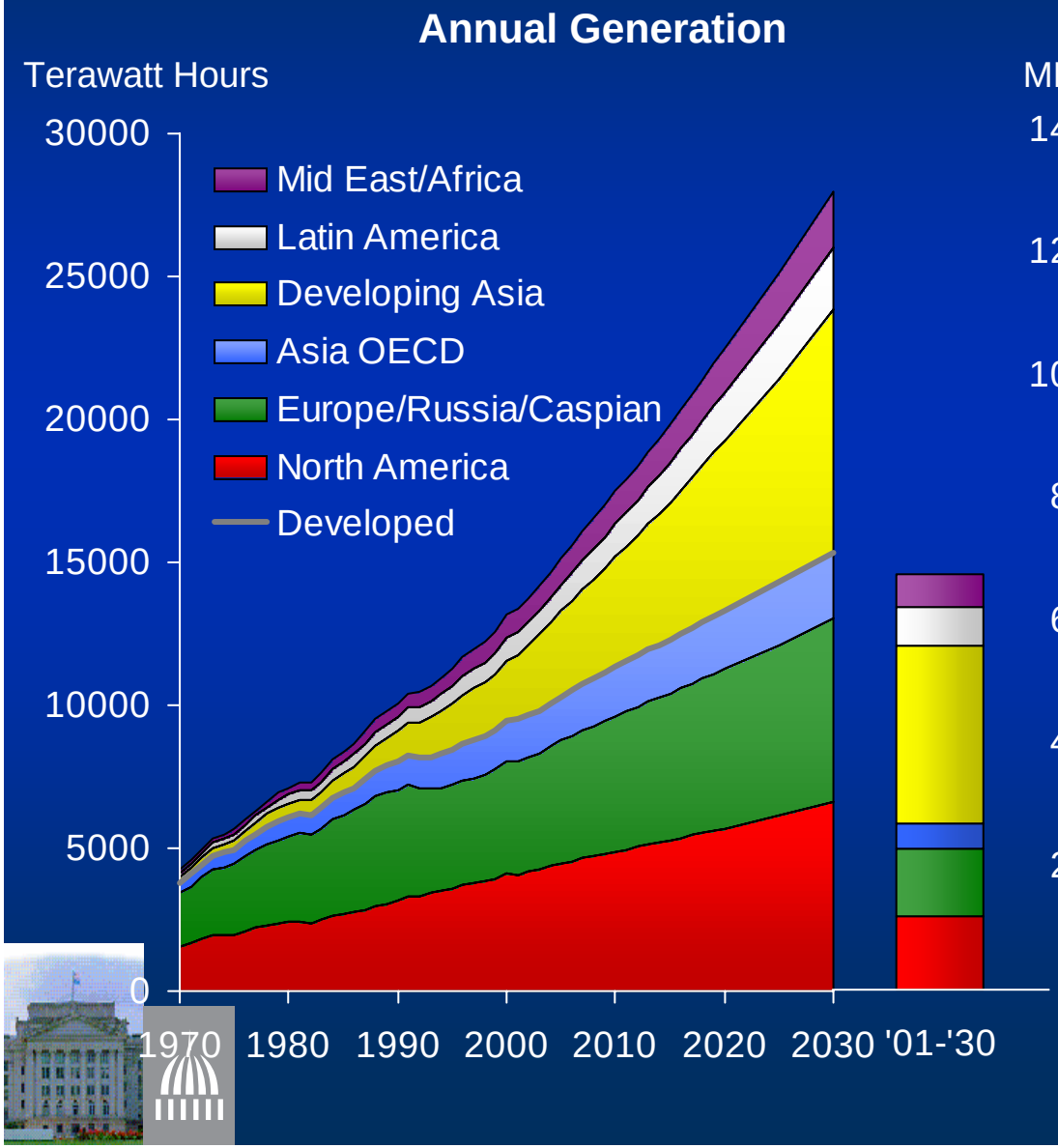
The Domestic Oil Trend

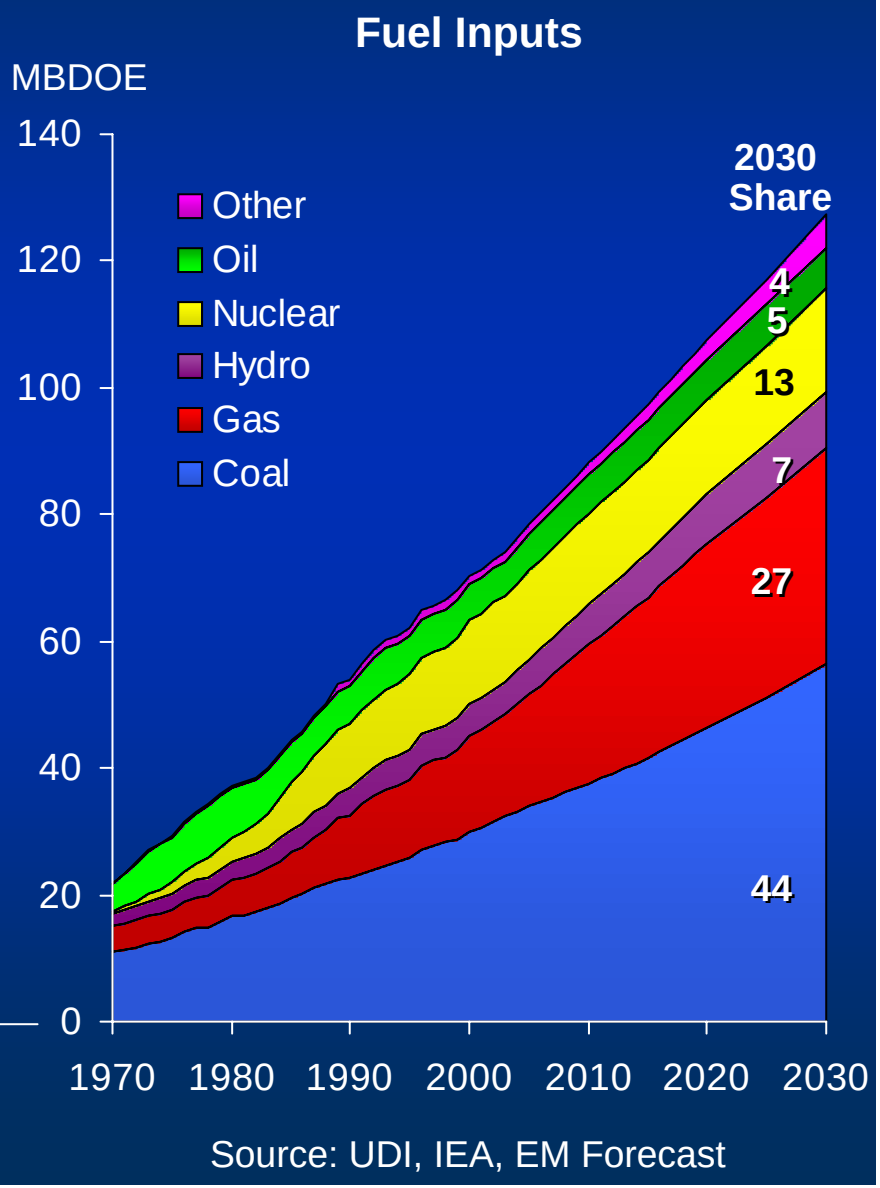


Oil & Gas Remain as Primary Energy Sources



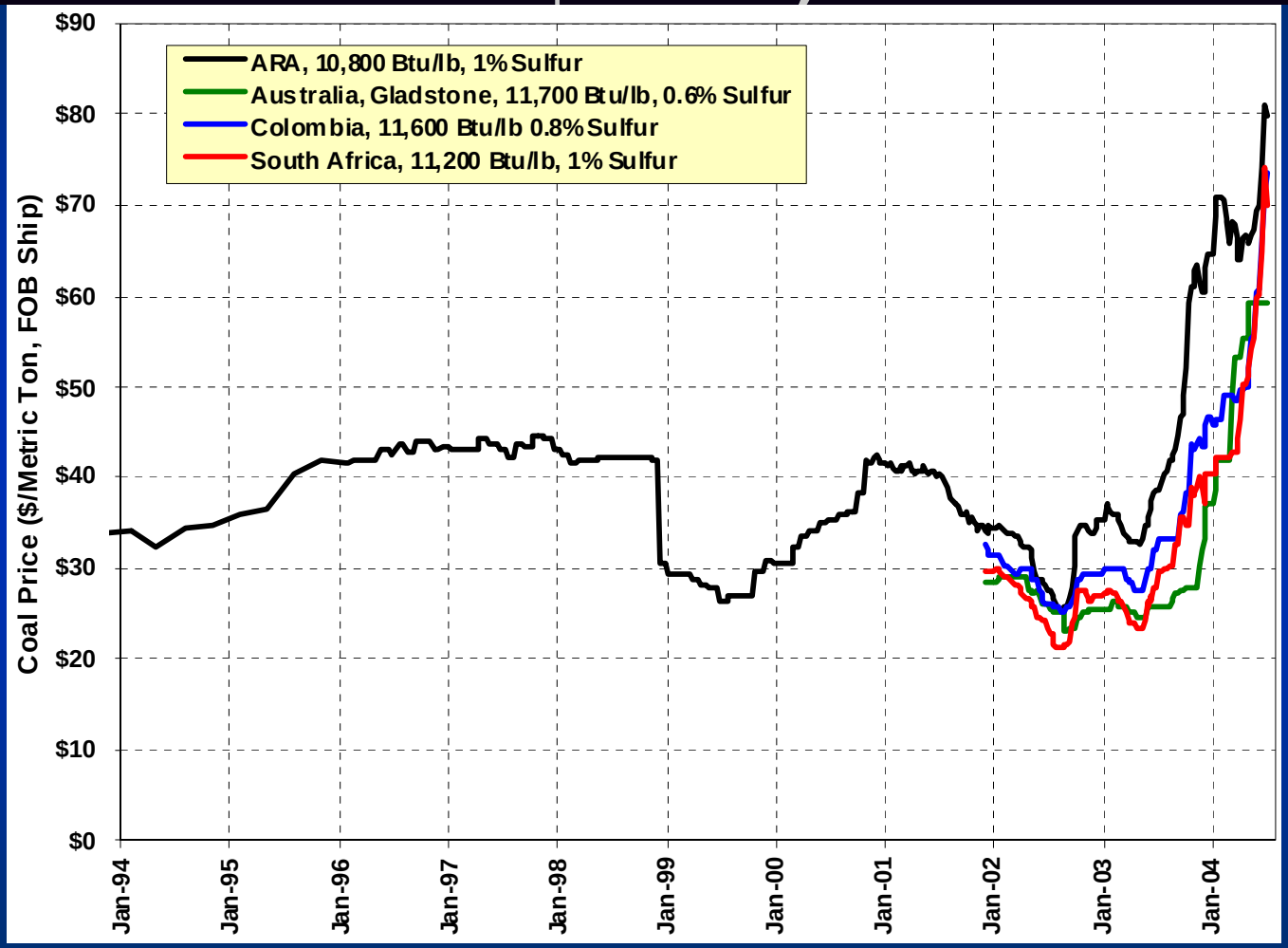
Coal & Gas Lead Power Generation Growth



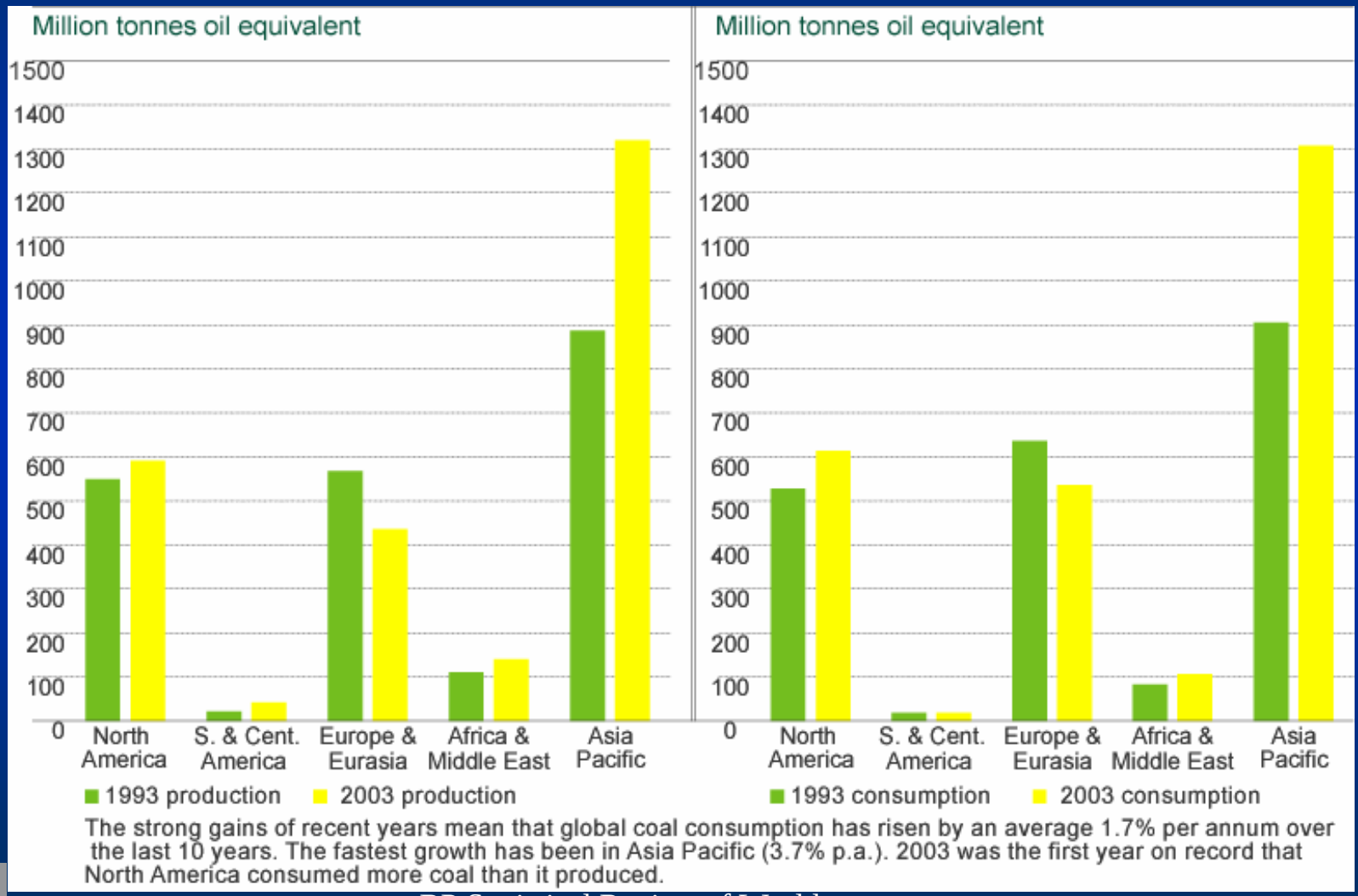


Source: UDI, IEA, EM Forecast

World Steam Coal Prices (U.S. $/MT)



Coal Production & Coal Consumption

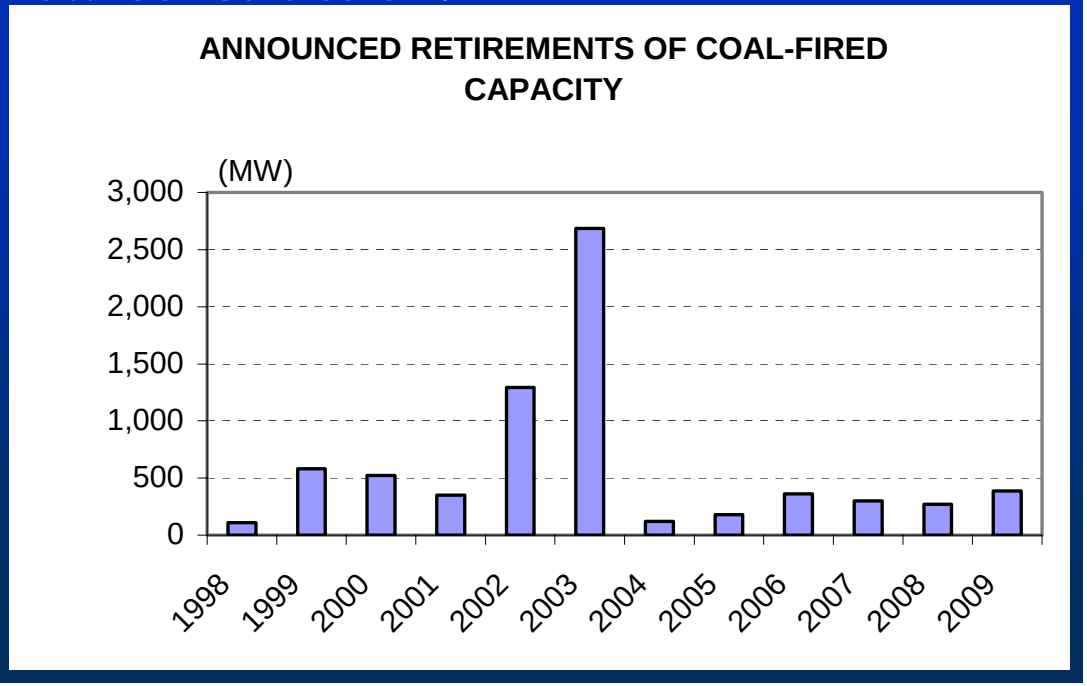


The strong gains of recent years mean that global coal consumption has risen by an average 1.7% per annum over the last 10 years. The fastest growth has been in Asia Pacific (3.7% p.a.). 2003 was the first year on record that North America consumed more coal than it produced.

BP Statistical Review of World Energy 2004

Retirement Of Existing Coal-Fired Plants

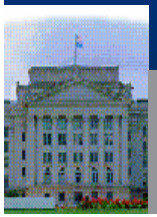
- Retirements of coal-fired units are being driven by environmental and economic issues.
- Most NSR settlements have included retirements or conversion to gas.
- Excess generating capacity has driven down power prices, making it uneconomic to invest in pollution controls at older, smaller plants.
- Retirements exceed the rate of new construction.



Environmental Issues Affecting Existing Coal-Fired Plants

- Large number of major issues:
  - NOx SIP call effective 2004
  - New Source Review litigation
  - Clean Air Interstate Rule (CAIR)
    - New fine particulate NAAQS-2008.
    - 8 Hour Ozone Standard
  - Mercury Rule
  - State Legislation
  - New Federal legislation

- The impact on coal:
  - Retrofit all controls (scrubber, SCR, baghouse) on most large (over 300 MW), new (post-1970) plants.
  - Close most old (pre-1960), small (under 150 MW) plants.
  - Shift utilization from uncontrolled plants to controlled plants.

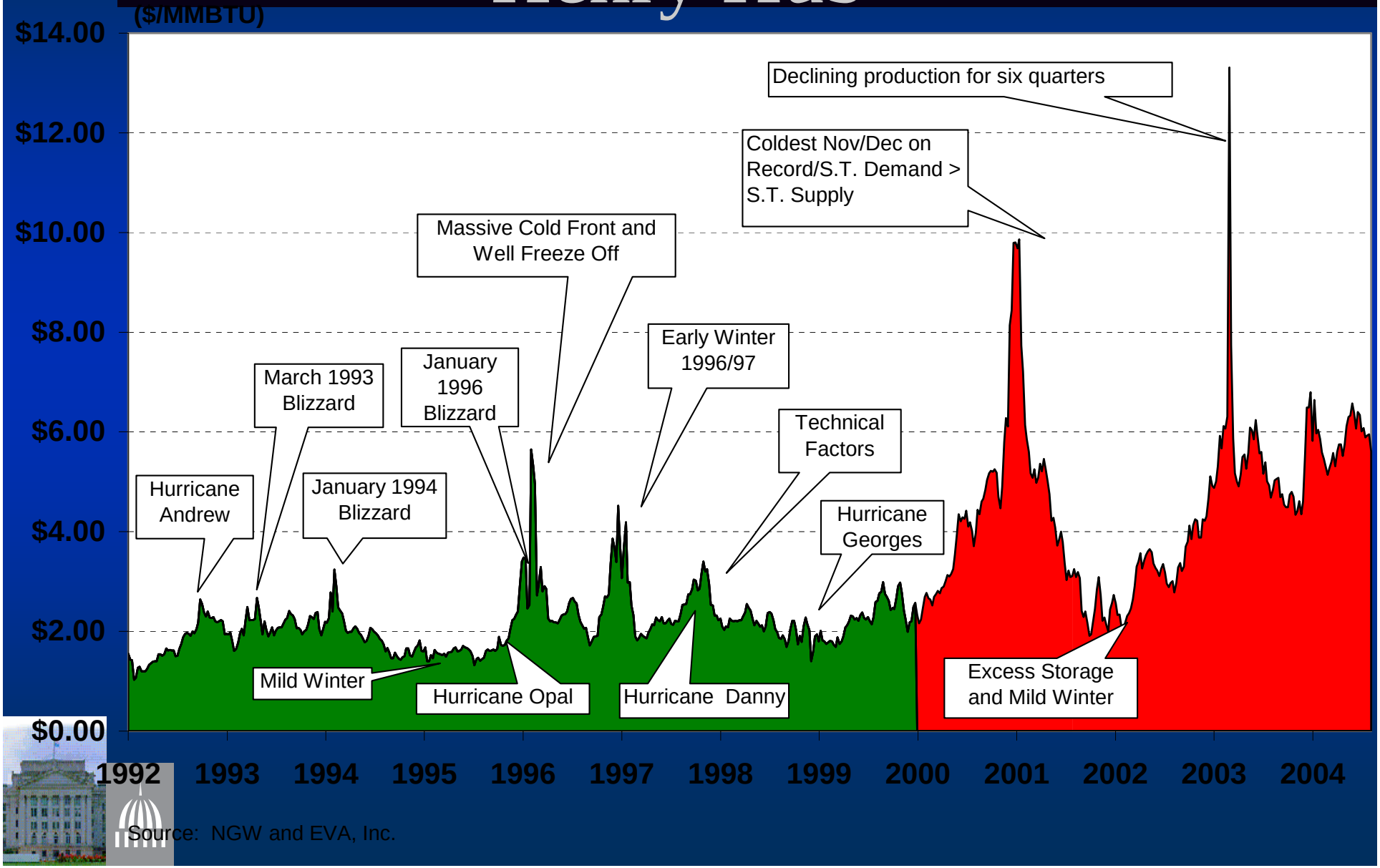


Consideration of Carbon Risk in Western IRPs is Becoming More Common

- **PacifiCorp:** multiple carbon scenarios, base case of $8 per ton of CO2 beginning in 2009
- **Idaho Power:** multiple carbon scenarios, base-case of $12.30 per ton of CO2 beginning 2008
- **Xcel/PSCo:** scenarios of $6 and $12 per ton of CO2 beginning in 2009
- **PGE:** scenario of $10 per ton of CO2
- **Avista:** of $1.32 - $11 per ton, beginning 2004
- **California:** CPUC requires utilities to consider carbon costs at $8 - $25 per ton of CO2

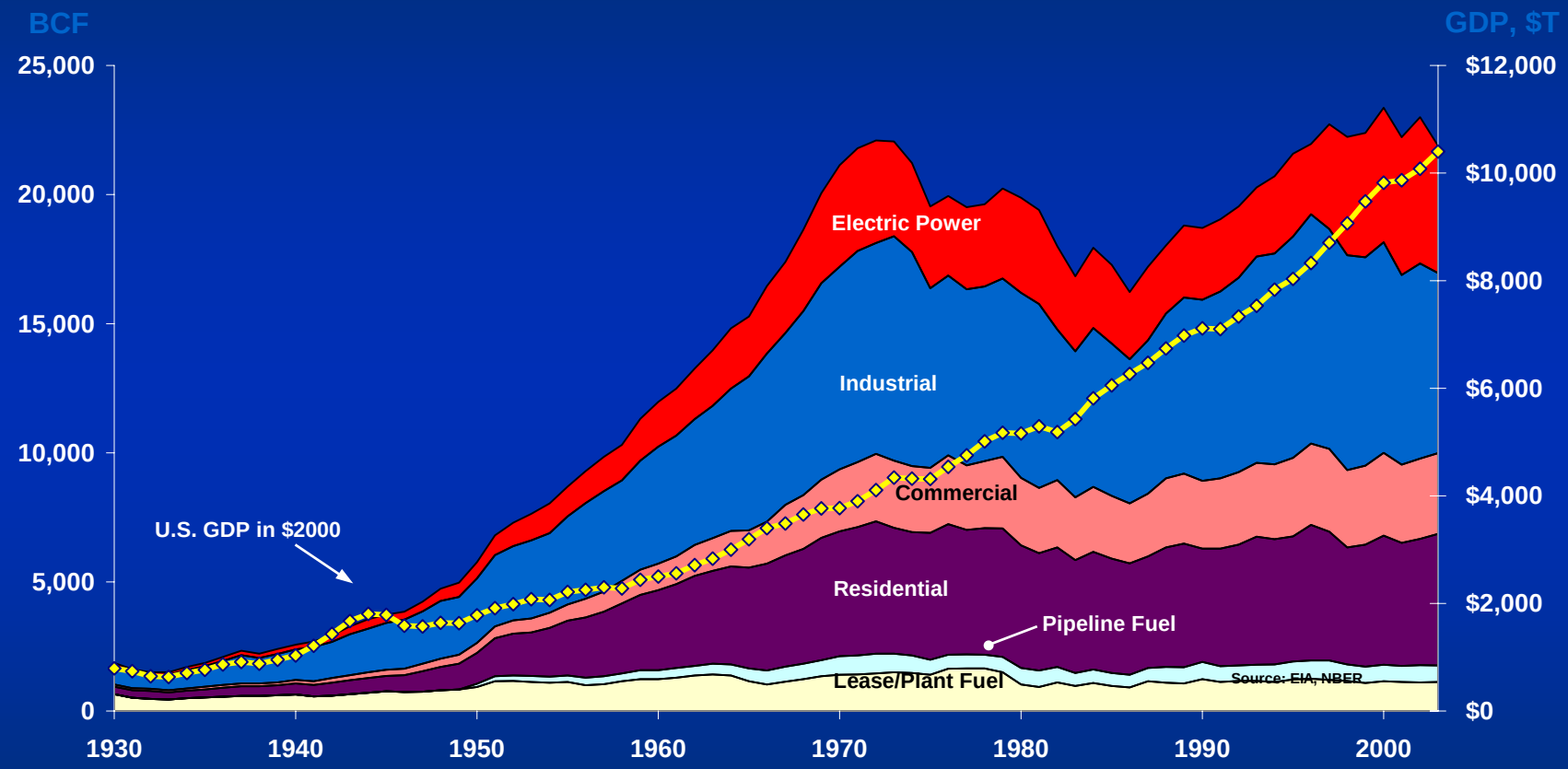
Can amount to a ~$5/MWh adder to a gas plant, and more for coal

Historical Gas Prices At The Henry Hub

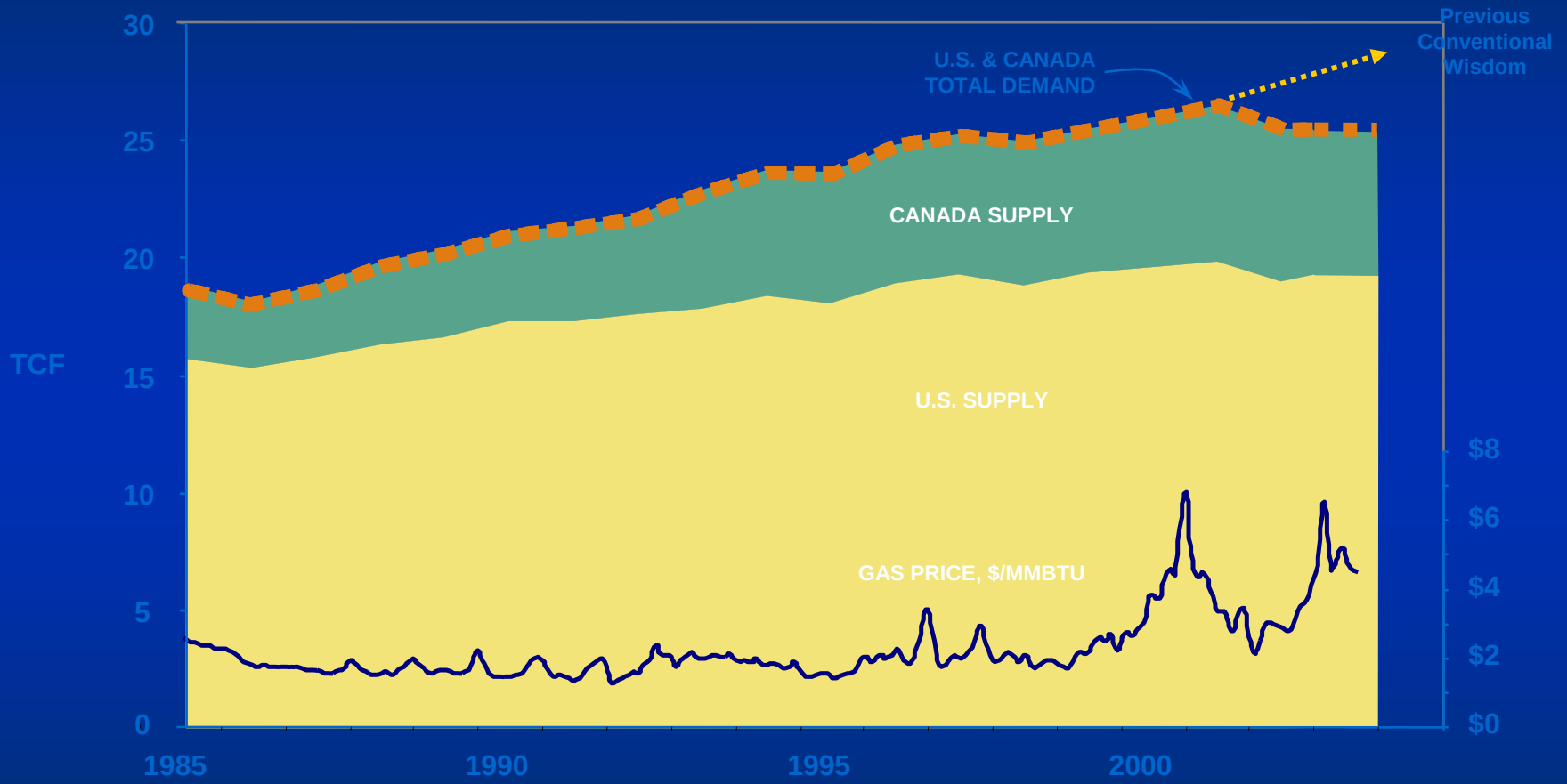


Source: NGW and EVA, Inc.

Historic U.S. Gas Demand

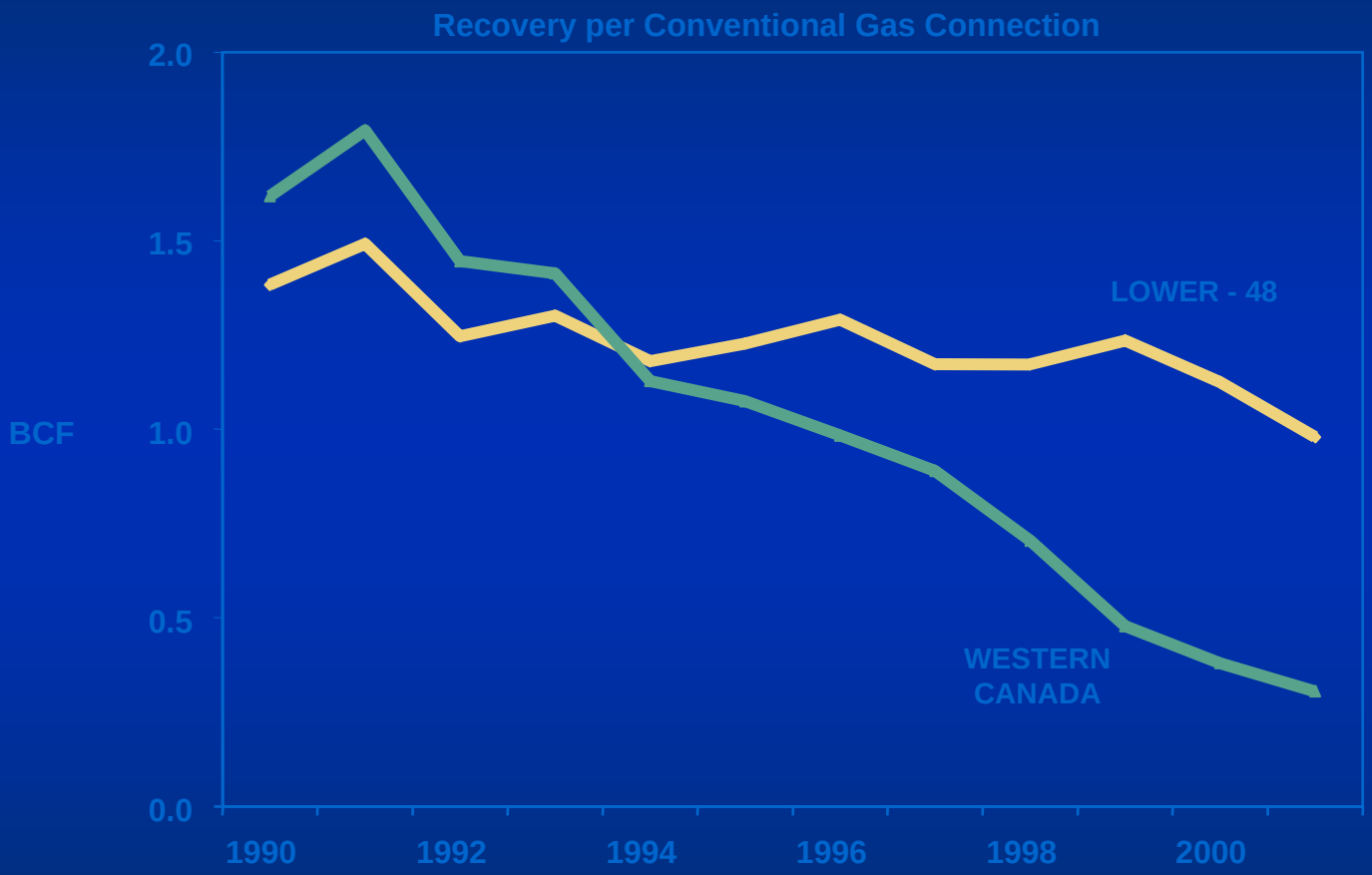


Dramatic Change in the Gas Picture



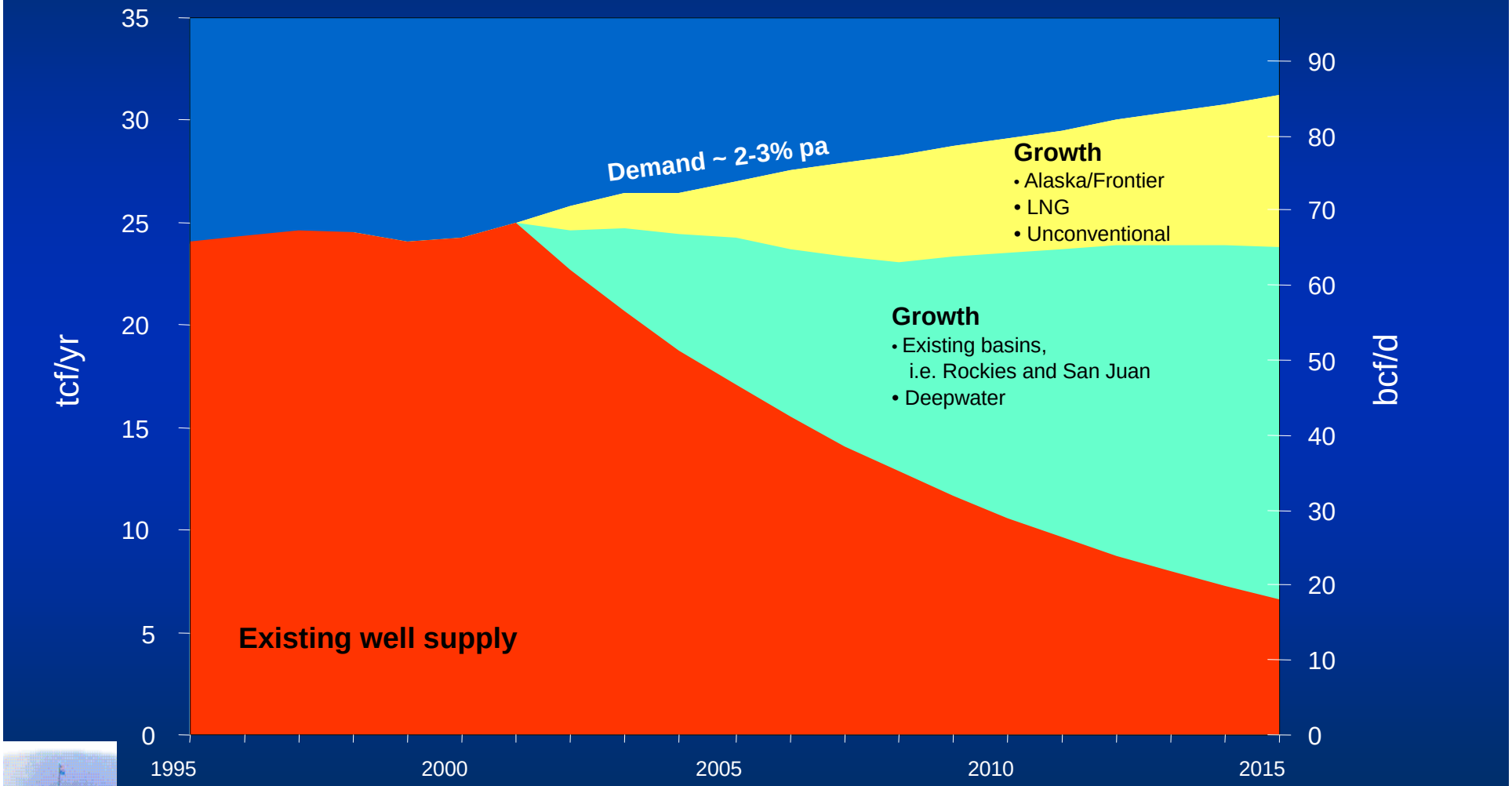
A Fundamental Shift in Supply & Demand

North America Well Recoveries



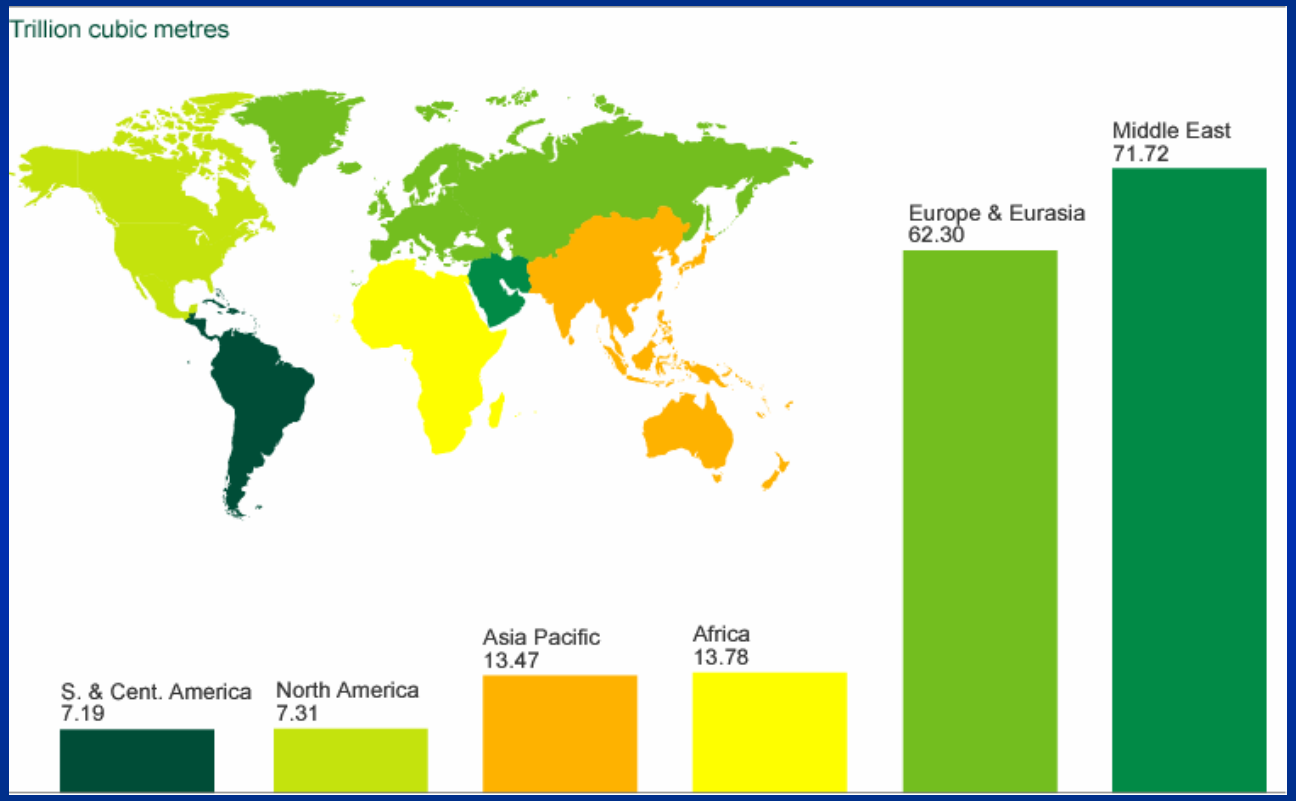
Production Confirms a Maturing Resource Base

North America - a market requiring world supply



Source : BP and industry estimates

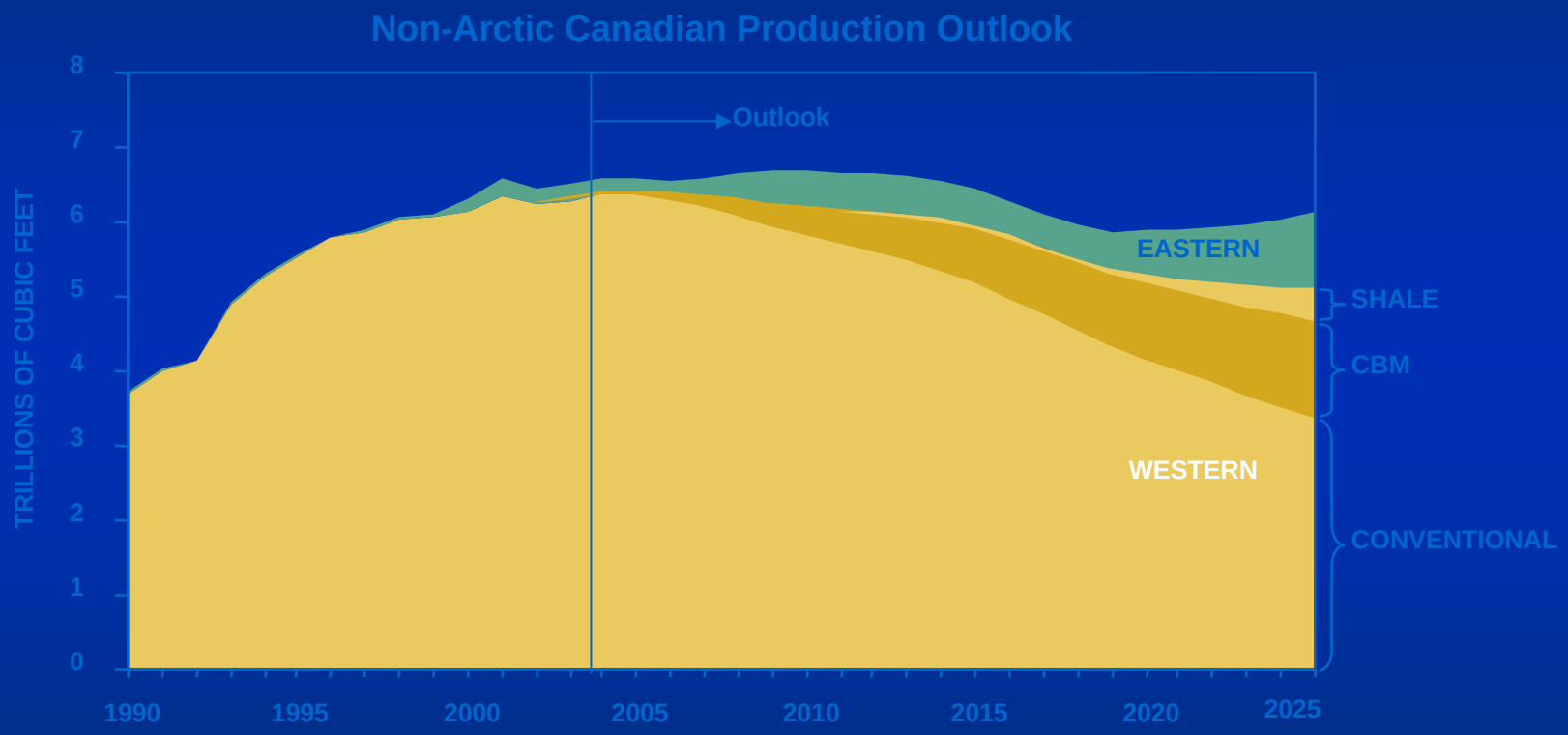
World Natural Gas Resources Are Vast



Source: BP Statistical Review

LNG: A Key Solution

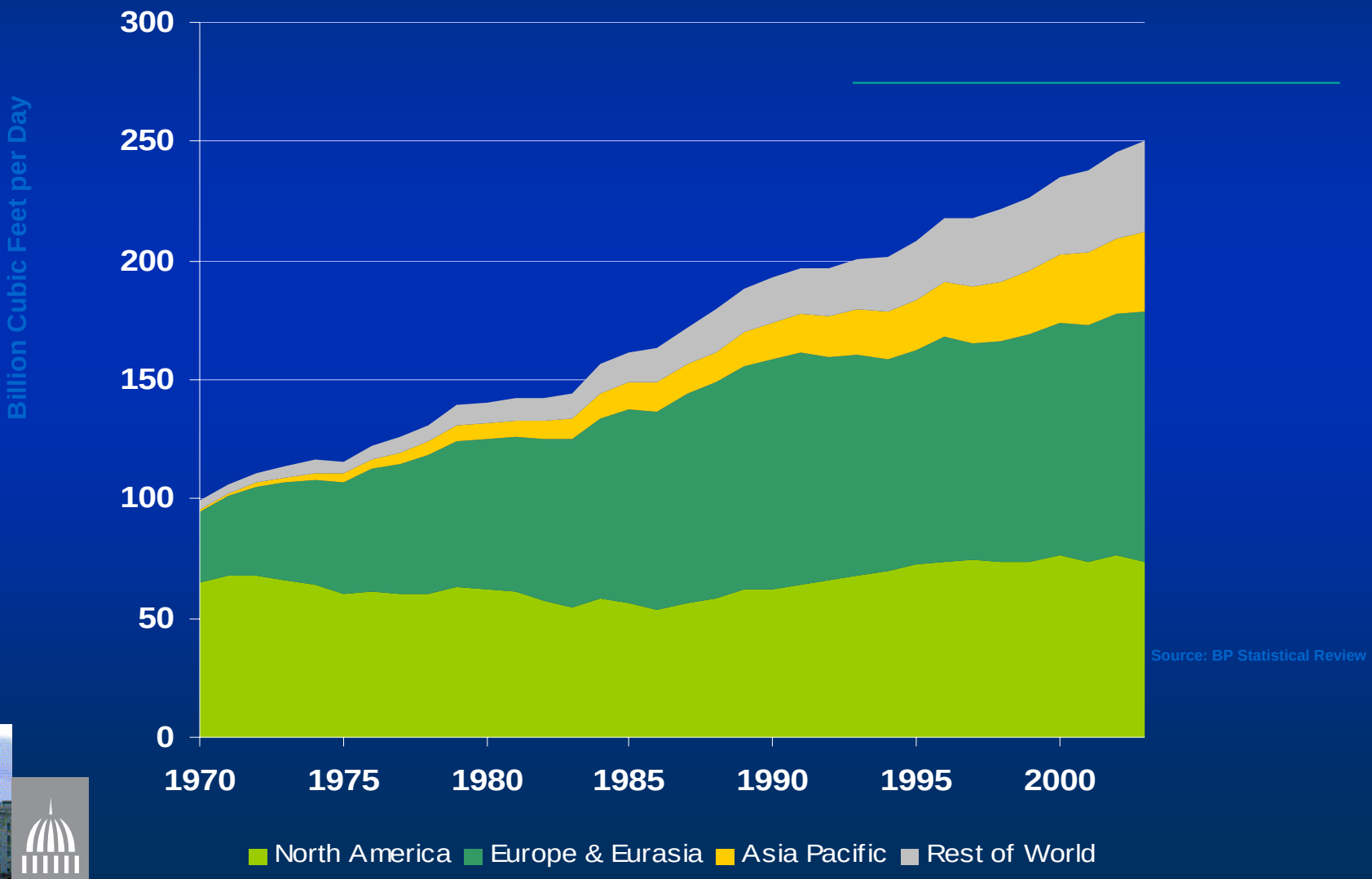
Outlook for Canadian Gas Supplies



Canada Production Plateauing

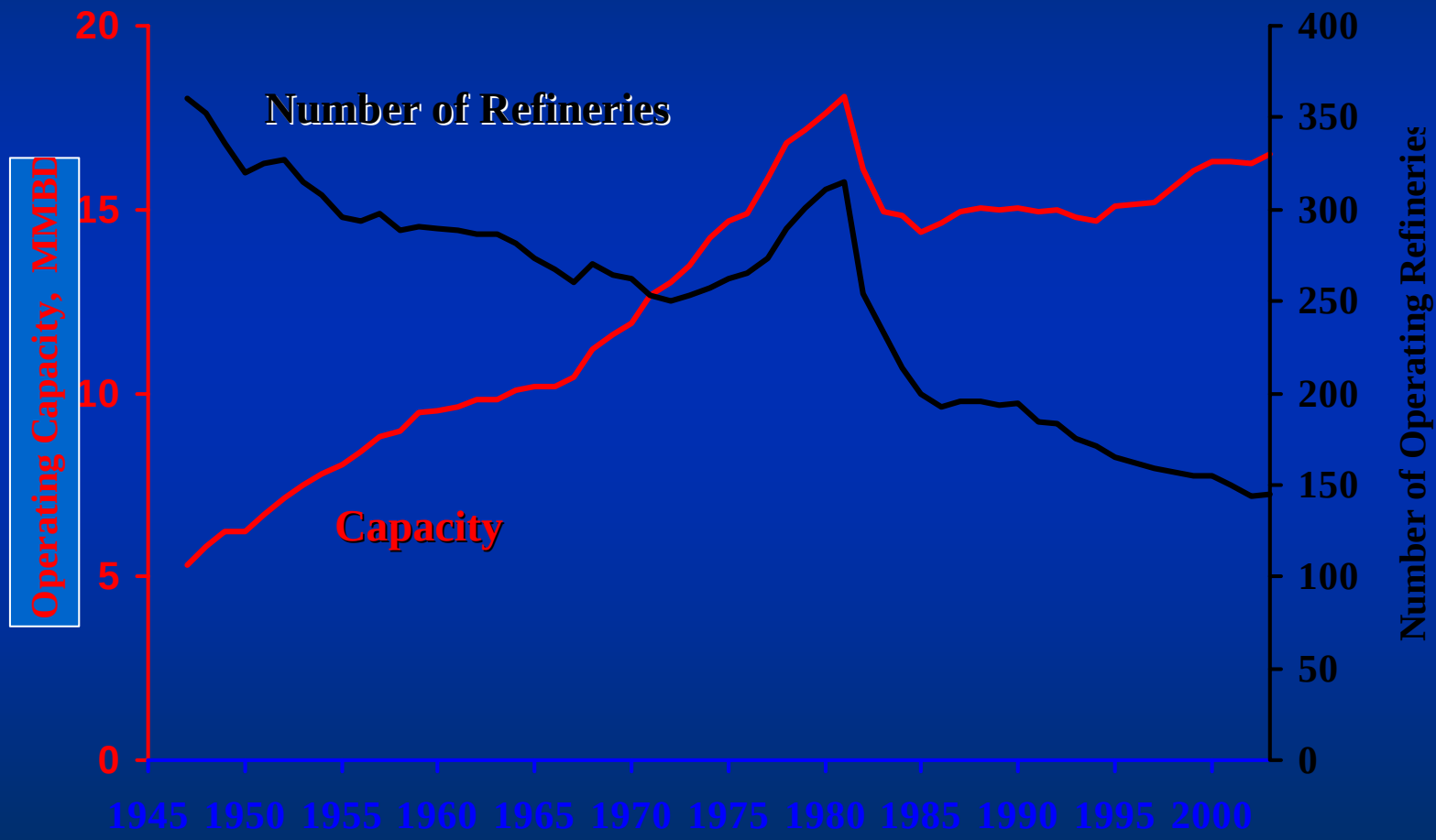
Proposed US Regasification Terminals

World Natural Gas Use



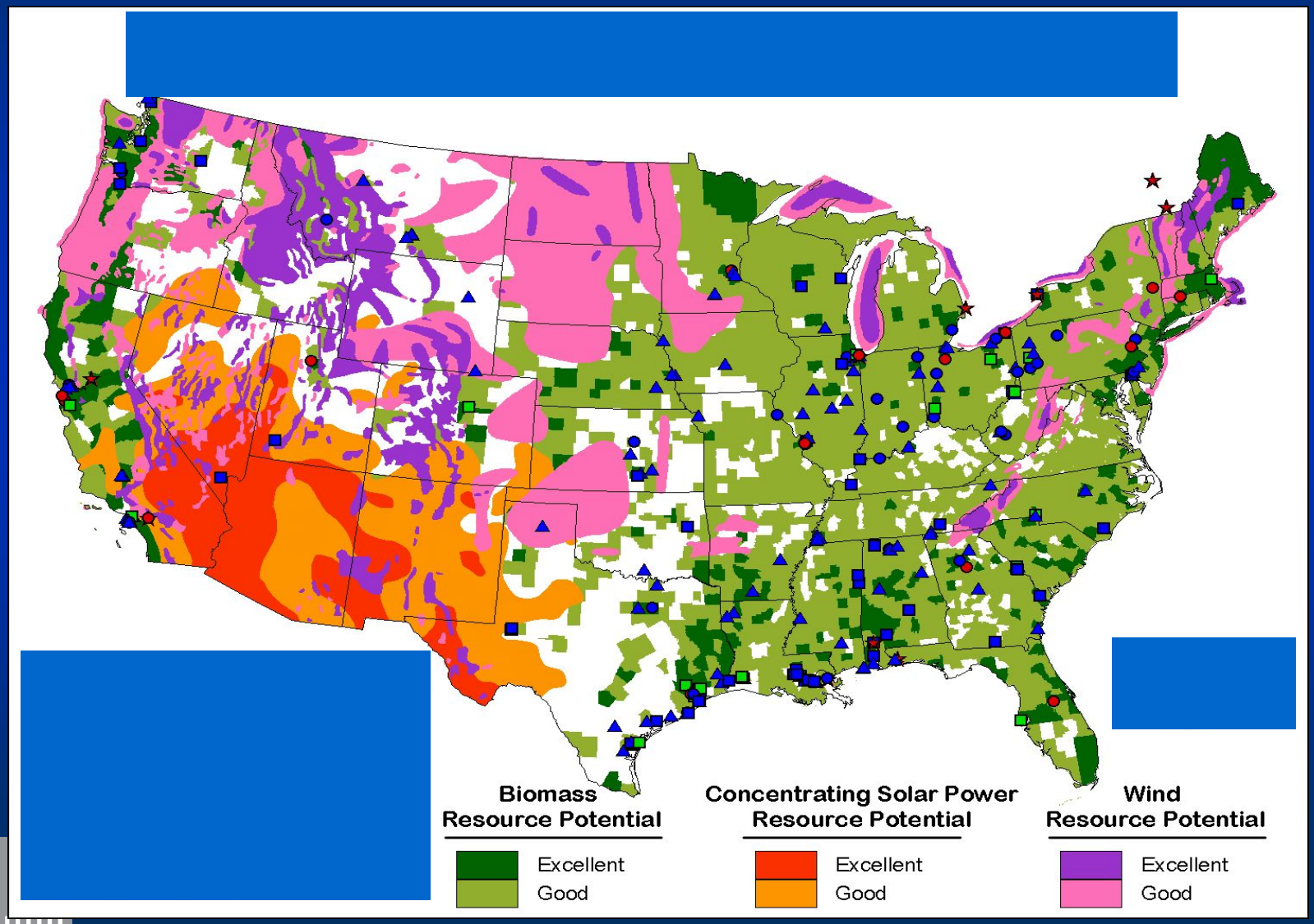
Source: BP Statistical Review

CAPACITY AND NUMBER OF U.S. REFINERIES

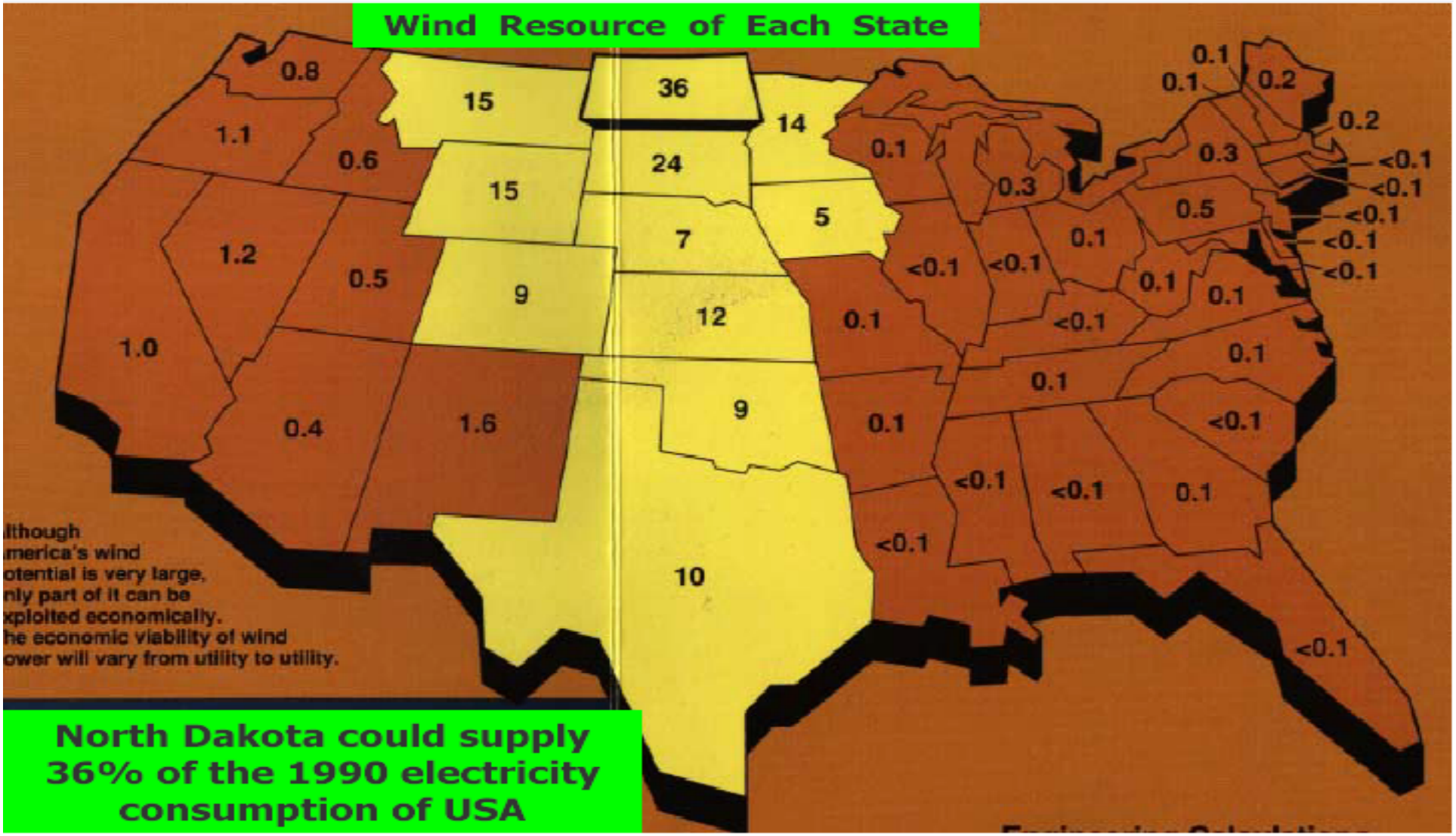


Source: API Basic Petroleum Data Book and EIA

Renewable Resources



NOT Limited by Resource
(for wind and solar)



Cost of Wind Energy Trend

1979: 40 cents/kWh

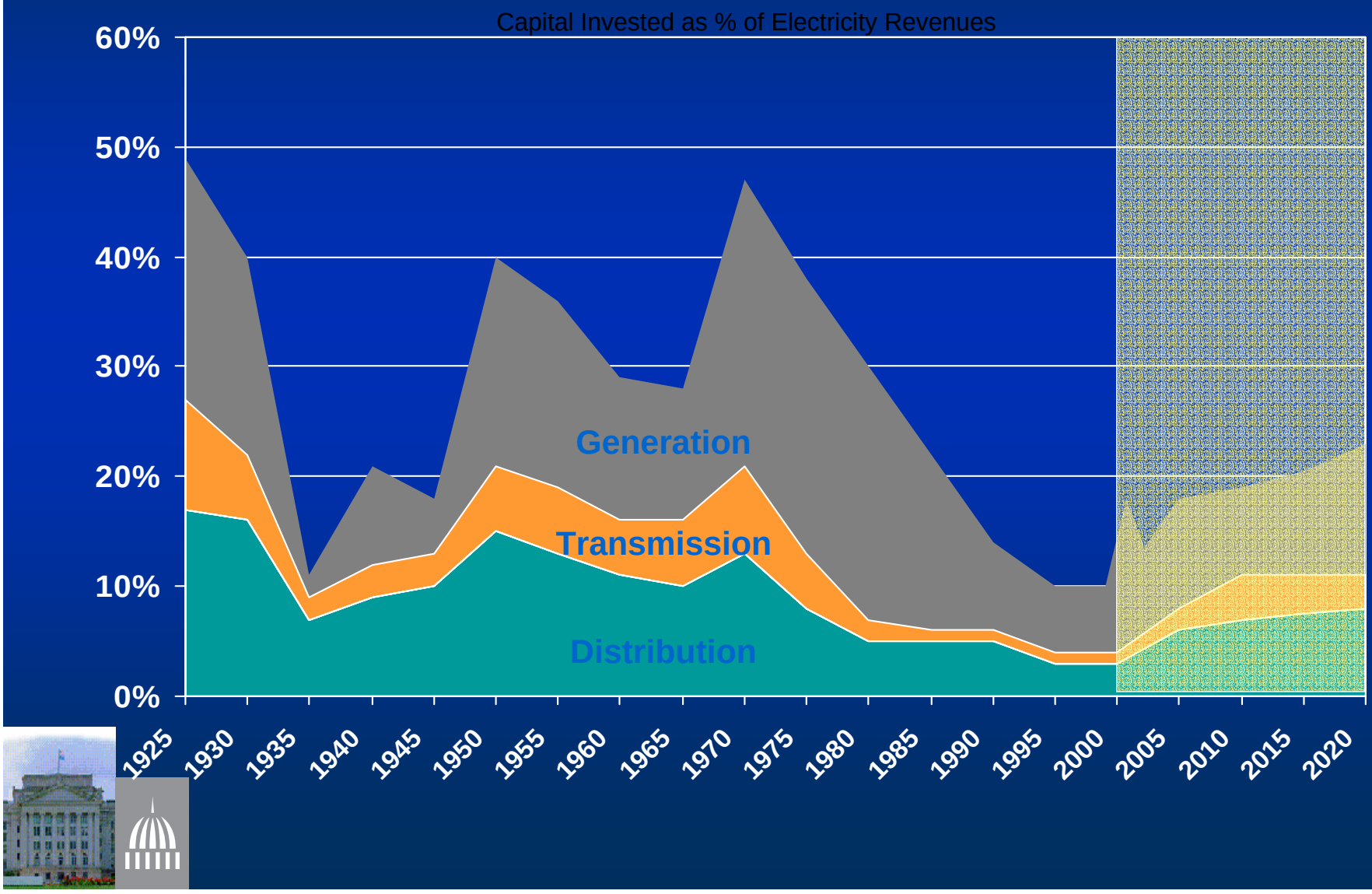
2000:
4 - 6 cents/kWh

- Increased Turbine Size and Height
- R&D Advances
- Manufacturing Improvements

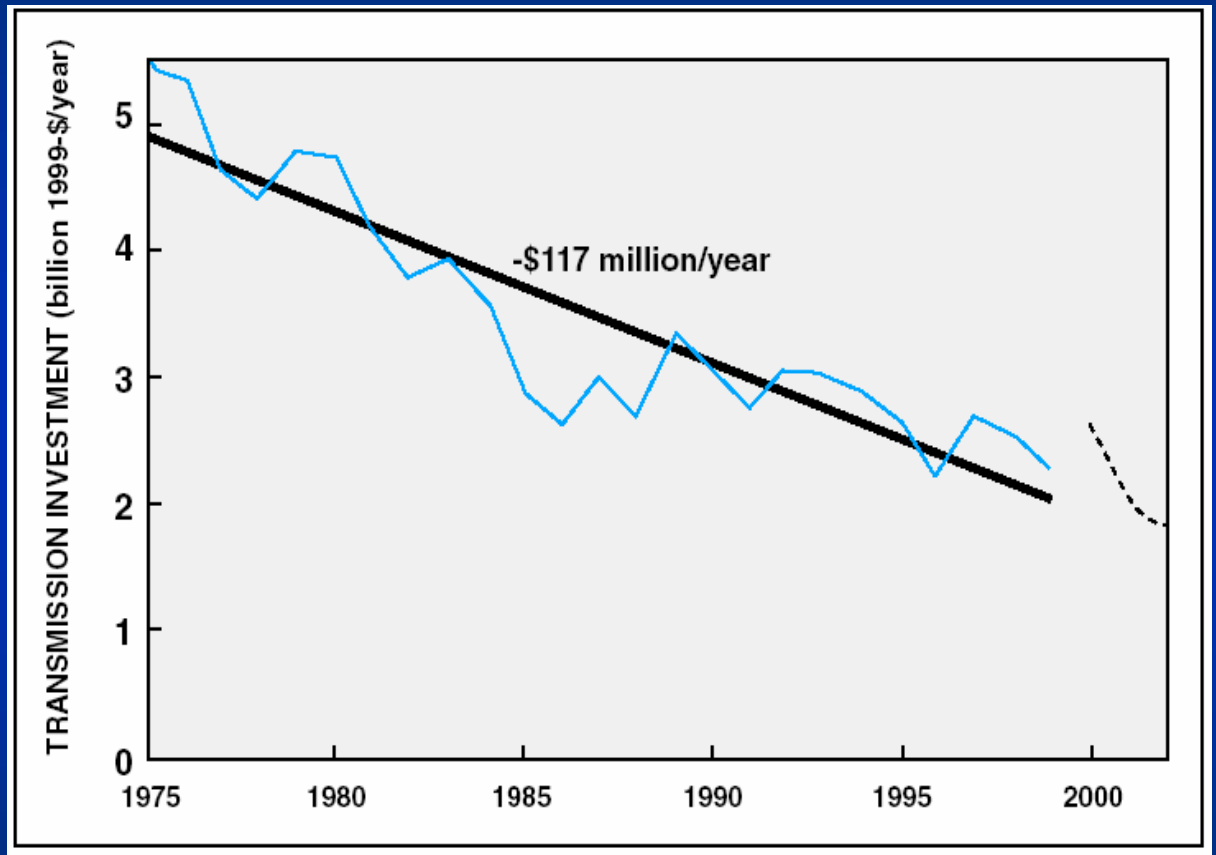
NSP 107 MW Lake Benton wind farm
4 cents/kWh (unsubsidized)

2004:
3 – 4.5 cents/kWh

Historical Utility Investment Trends



Transmission investment has been declining.



Investment in new transmission facilities has declined steadily for the last 25 years.

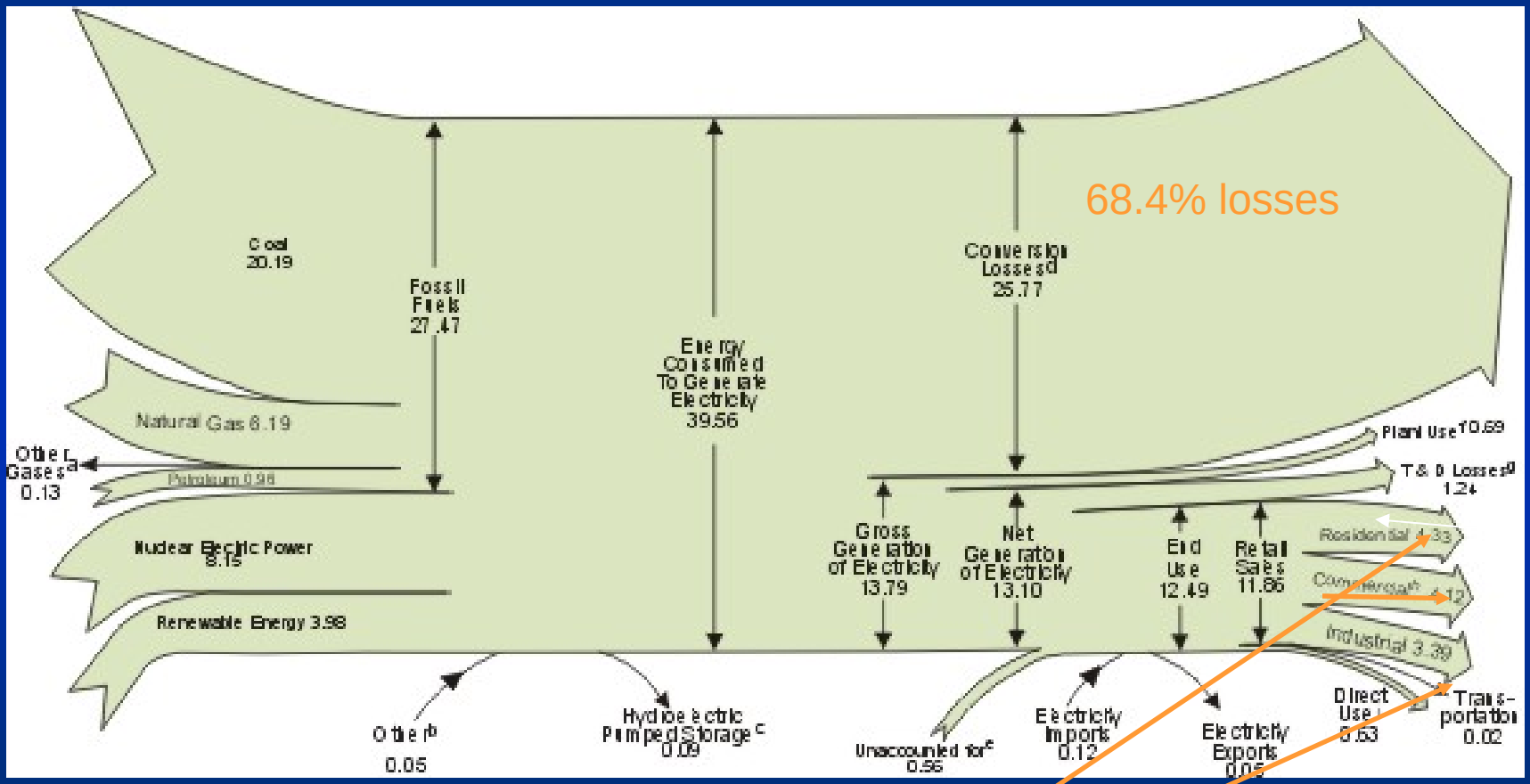
Electricity demand increased by about 25% since 1990, construction of transmission facilities decreased about 30%.

Distribution investment has stayed in pace with growing demand.

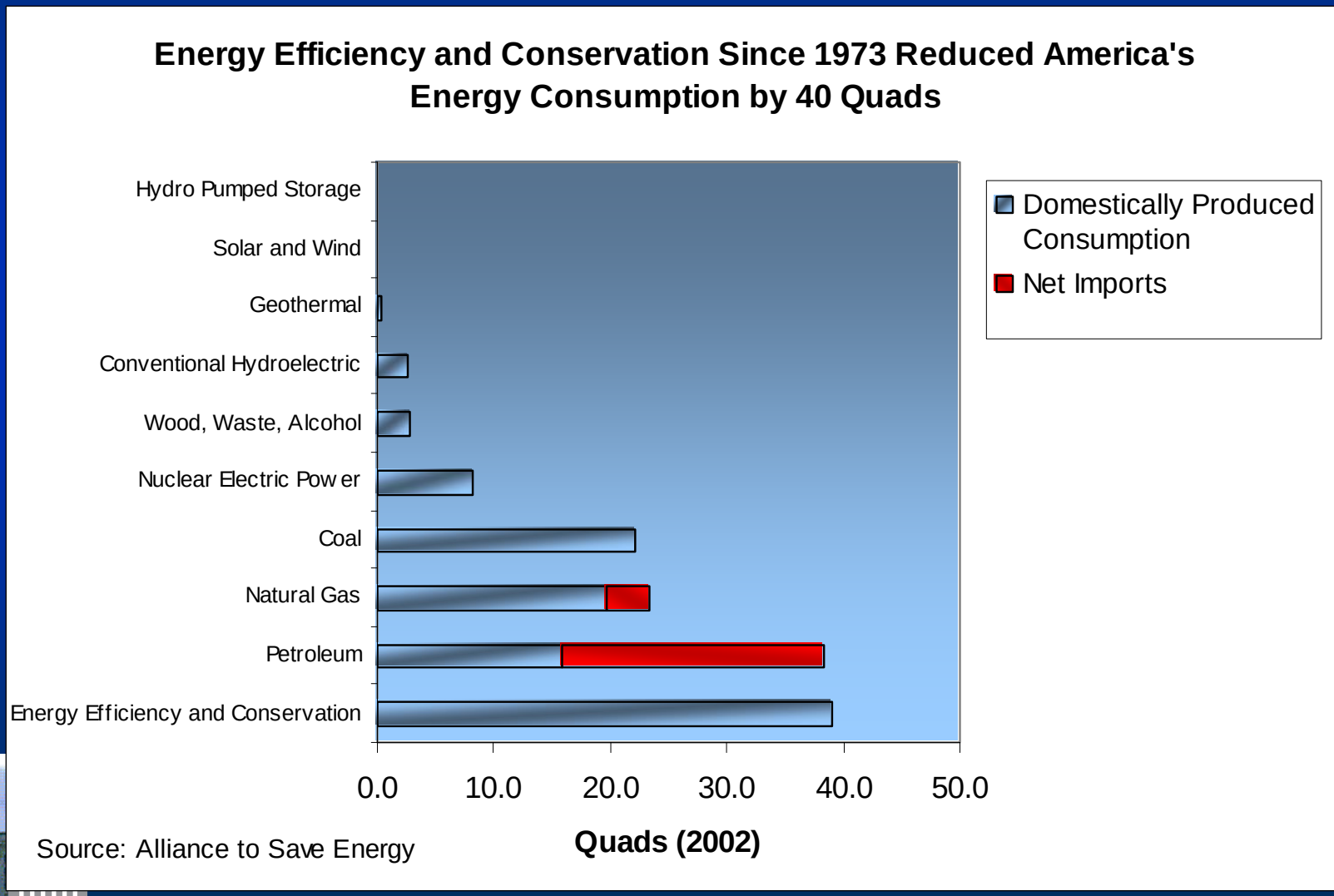
Transmission and distribution losses (which are related to how heavily the system is loaded) were about 5% in 1970, and grew to 9.5% in 2001, due to heavier utilization and more frequent congestion.

DOE National Grid Study, page C-2.

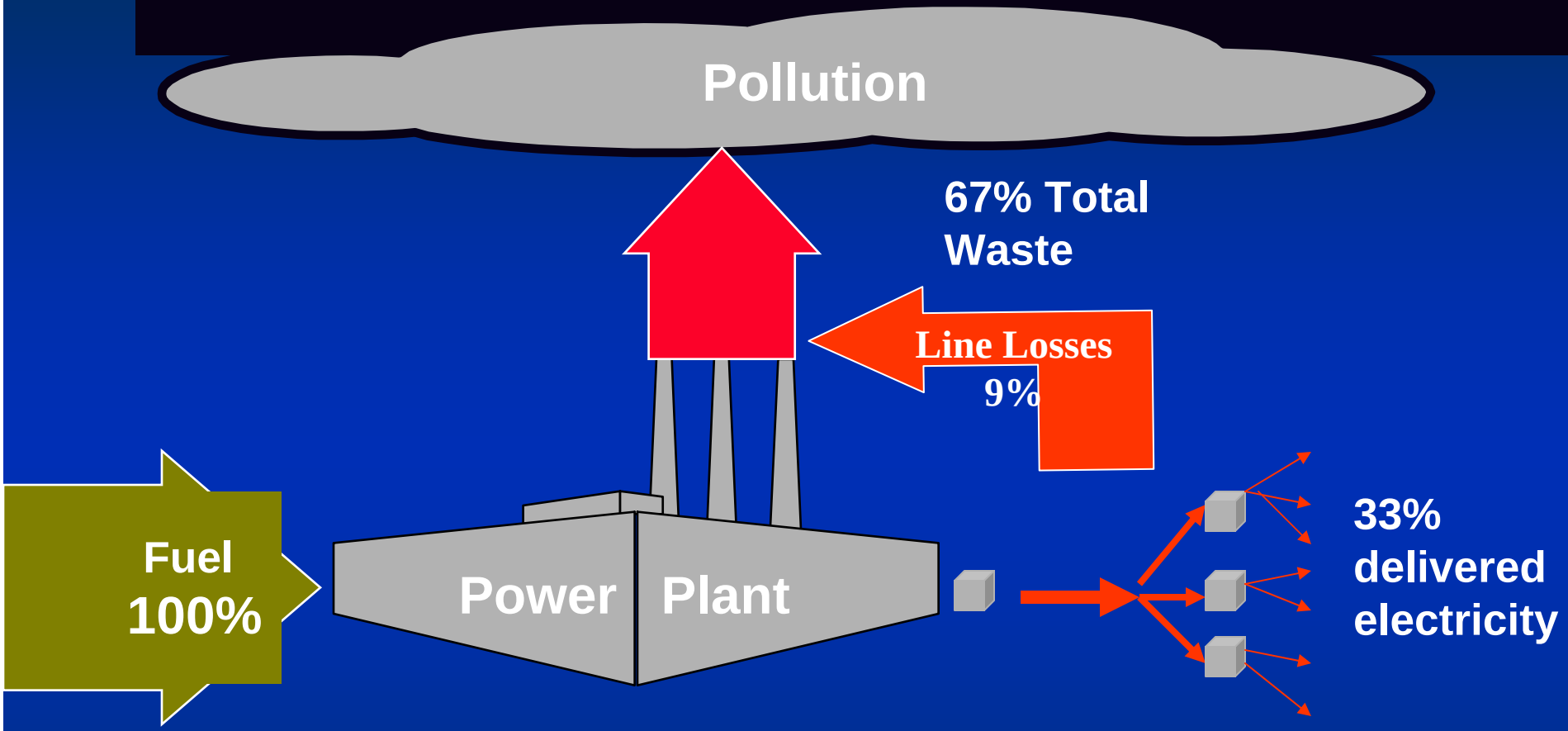
Electricity Generation and Use



Efficiency is a Big Energy Resource



Conventional Central Generation

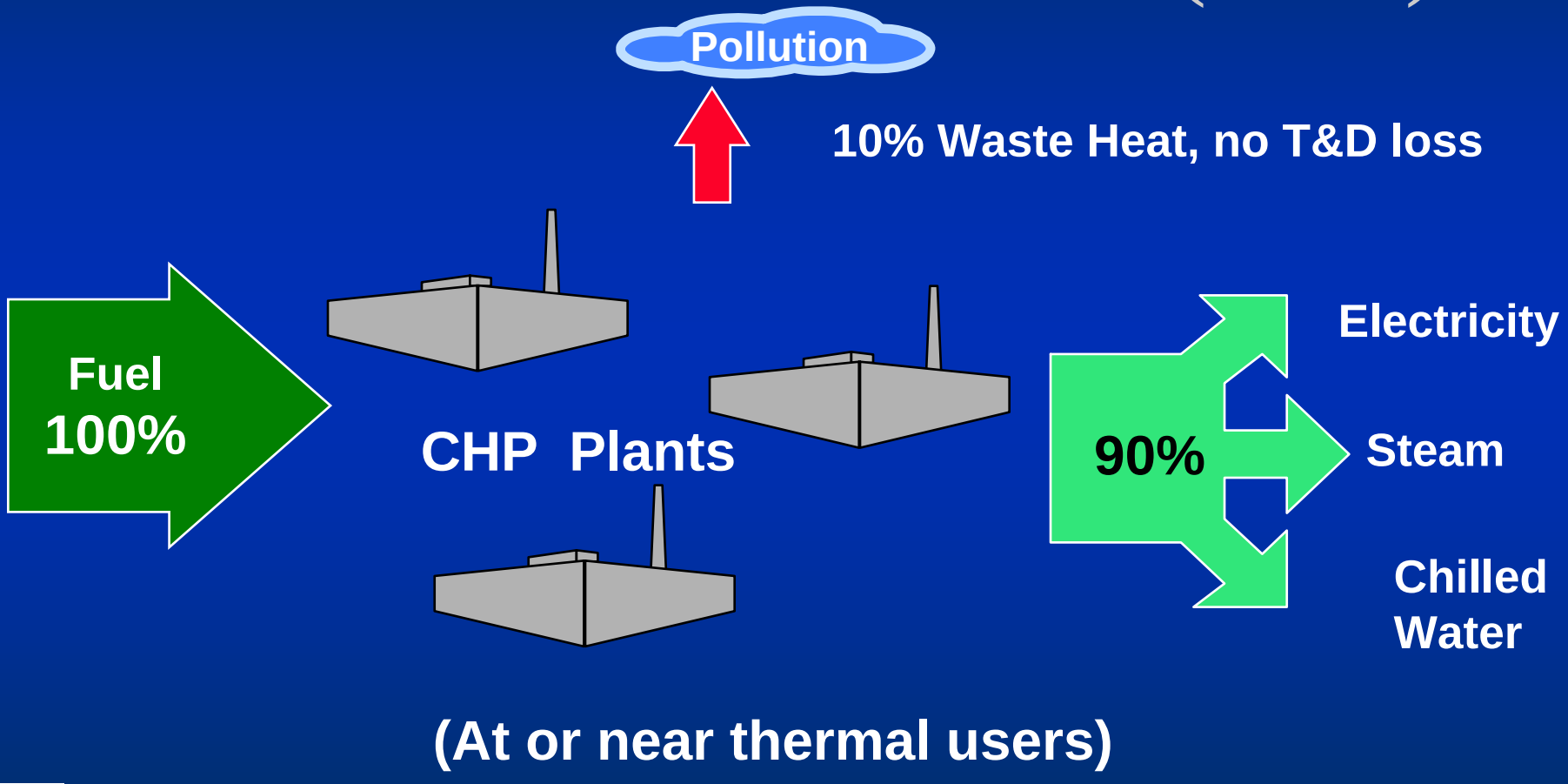


Generation: $890 / kW

Transmission: $1,380 / kW

End user: .91kW: $2,494 / kW

Combined Heat and Power (CHP)



The Options

- Build up our domestic resources.
- Use what we have efficiently.
- Improve our ability to transport energy from one place to another.

What Can South Dakota Do?

- Develop a state energy policy, with specific goals.
- Conduct a study of its energy situation and short/long term energy risks.
- Identify specific methods to reach specific goals (for example):
  - Increase use of domestic energy resources
  - Export energy resources out of state
  - Increase efficiency of energy use now
  - Reduce energy costs
  - Increase reliability
  - Give more options generate power on site